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"must not come into conflict with what has been ascertained and established in "other domains, whether moral, scientific, or philosophical."

From the bottom of our heart we say, Amen! These sentences from one of the most prominent theologians of to-day express exactly the position which we have taken in both magazines, *The Open Court* and *The Monist*, and which we have defended and advanced in all our publications. Whatever disagreements we may have with Professor Tiele in definitions or in the formulation of laws such as determine the development of religion, we know ourselves to be in full sympathy with him concerning the maxims of treating religion, and take the same attitude as to the fundamental principle of theology as a science.

P. C.

TRAITÉ ÉLÉMENTAIRE DE MÉCANIQUE CHIMIQUE, FONDÉE SUR LA THERMODYNAMIQUE.

By *P. Duhem*, Professor of Theoretical Physics in the Faculty of Sciences at Bordeaux. Tome III. Les mélanges homogènes; les dissolutions. Large octavo. Paris: A. Hermann. 1898. 380 pages.

Physical chemistry, or at least the mathematical theory of the subject, is known in France as "chemical mechanics." In the present large work by Duhem, it is treated as a branch of thermodynamics, or, rather, as a branch of the general energy theory. The object of the energy theory is to describe the mutual transformations of work and the work-equivalents of effects that are producible by the expenditure of work. Its adequateness to this end makes it the most serviceable method we have for the study of physical chemistry; for chemical phenomena, in their physical aspect, may be regarded as interchanges of work and thermal, electric, and chemical work-equivalents.

A very complete description, in particular, of the more or less complicated states of equilibrium to which chemical changes lead, is supplied by the energy theory. For, a fundamental theorem of the theory assigns the direction in which spontaneous processes proceed under given conditions; and herefrom it is possible to deduct at once the characteristics of the resulting states of equilibrium. The development of the thermodynamic theory of chemical equilibrium is due, in the main, to our countryman J. Willard Gibbs. The labors of Duhem have served to amplify it, and to develop some of its more remote consequences.

In arranging his material, Duhem follows, roughly, the historical order. He presents first the fundamental principles of thermodynamics; then the thermodynamic behavior of single substances, i. e., the phenomena of vaporisation, fusion, the transformation of allotropic forms, and the continuity of liquid and acirform states; and, finally, in the present third volume, the newer theory of the physical behavior of solutions. A fourth volume, yet to appear, is to complete the whole.

This book of Duhem is the first serious attempt that has been made to produce a comprehensive treatise on mathematical chemistry. It is fortunate that the task has been undertaken by so competent a man. And it is a great convenience to the

specialist to have assembled here, in well-rounded form, the results of the many voluminous memoirs that Duhem has published during the past dozen years.

The book, on the whole, has been carefully written. It gives a good general view of its subject; many of its features are new, both in form and in matter; and it gives everywhere evidence of great erudition. One serious objection only is to be made to it: its style is diffuse. The whole thing might have been written in fewer words, and with fewer equations.

J. E. TREVOR.

LEÇONS DE CHIMIE PHYSIQUE, PROFESSÉES A L'UNIVERSITÉ DE BERLIN. By *J. H. van't Hoff*. Translated from the German by M. Corvisy. Première partie: La Dynamique chimique. Paris: A. Hermann. 1898.

Two very important treatises on physical chemistry are now appearing in parts. One of these is Ostwald's enormous *Lehrbuch*, the other is van't Hoff's *Lectures on Theoretical and Physical Chemistry*. Both are written in German; but in the present volume we have a French translation of the First Part of van't Hoff's book. These two authors being, probably, the best known teachers and investigators in physical chemistry, comprehensive works by them on the subject have an unusual interest.

Van't Hoff's book presents substantially its author's lectures at the University of Berlin, but expanded somewhat beyond their original limits. Its subject-matter is assembled in three parts, under the heads, "chemical dynamics," "chemical statics," and "composition and properties of matter." The present first part, on chemical dynamics, treats of "the mutual actions of bodies, chemical transformation, affinity, the velocities of reactions, and chemical equilibria," thus comprising the greater part of what is commonly understood as physical chemistry. The two remaining parts will almost necessarily contain a lot of incoherent details, and a collection of the hypothetical lumber of the subject—"the constitution of matter atoms, molecules, and the structure and configuration of molecules."

In presenting each topic, van't Hoff begins with an experimental study of a concrete example, usually one that has been investigated in his own laboratory; then represents graphically the results that are obtained; and, finally, draws his general conclusion and elaborates its theoretical development. This natural method, together with the clearness with which the book is written, are certain to make it what its author intended it to be: "An aid to those who wish to assimilate the recent achievements of physical chemistry."

J. E. TREVOR.

CALCUL DE GÉNÉRALISATION. By *G. Oltramare*, Doyen de la Faculté des Sciences de l'Université de Genève. Paris: Librairie Scientifique. A. Hermann, rue de la Sorbonne 8. 1899. Pages, 191.

The present work is one belonging to higher analysis, and will claim the attention of advanced mathematicians and logicians only. *The Calculus of Generalisation*, which is the name that Dr. Oltramare has given to his science, is con-